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CONTENTS

Page

De Leon, Donald—Four New Acarina in the Family Tarsonemidae 105

De Leon, Donald—Brevipalpus floridianus, a New Mite from Southern Florida (Acarina: Tenuipalpidae) 113

Muma, Martin H.—Life Cycles of Four Species of Ladybeetles 115

Carriker, M. A., Jr.—Report on a Collection of Mallophaga, Largely Mexican (Part II) 119

Beck, Elisabeth C.—A New Species of Culicoides from Florida with Additional Distribution Data for the Genus (Diptera: Heleidae) 133

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FOUR NEW ACARINA IN THE FAMILY TARSONEMIDAE

Donald De Leon
Coral Gables, Florida

Mites of the family Tarsonemidae feed on green plants or on fungi. Of the species described below, *Steneotarsonemus paspali* and *S. furcatus* feed on *Paspalum* sp.; *Hemitarsonemus cocosi*, from the coconut palm, has not been found in sufficient number to make it possible to determine its feeding habits; *H. lodici* feeds on several hosts, being most common on *Psychotria undata*.

In the descriptions, I have followed Beer's terminology (1954)[1] except in respect to the transverse apodeme; as this is often separated into two parts, I have treated it as a pair of apodemes. All measurements are in microns. Corresponding measurements of the opposite side of the same specimen or of different specimens sometimes vary more than twenty per cent; in such cases the range has been given. When the measurements are fairly uniform they have been given in averages.

Steneotarsonemus paspali, n. sp.

The male of *S. paspali* runs to *ananas* (Tryon) in Beer's key, but it differs in many characters from his drawings and from his description of this species. It appears to be more nearly related to *spirifex* (Marchal), but differs from Beer's redescription and drawings of this species by the first propodosomal being shorter than the other propodosomals, by the anterior median apodeme being distinct between apodemes I and II, by the inner ends of the transverse apodemes being widely separated, and by other characters. The female differs from Beer's description of this sex of *spirifex* by the widened apodeme I, by the C-shaped rudimentary transverse apodemes, by the capitulum being wider than long and by other characters.

Male:—Body creamy white, length from anterior end of capitulum (including palpi) to posterior tip of genital papilla 200, width 105, widest just anterior to coxae III; capitulum emarginate basad, size and shape variable, generally about 28 long (including palpi) and 30 wide, but in some specimens about 21 long and 21 wide.

Dorsal chaetotaxy: Propodosomal setae approximately in line, 14, 15, 55, and 24 long respectively, distance from preceding seta 8, 10, and 20 respectively; hysterosomal setae 22, 7, 13 and 9 long respectively; first (the humeral) fine, the others coarse; first at side of body, about 33 from main body suture; second about in line with and about mid-way between first and third; third about its length anterior to secondary body suture, distance between bases 31; fourth at outer edge of basal third of genital papilla.

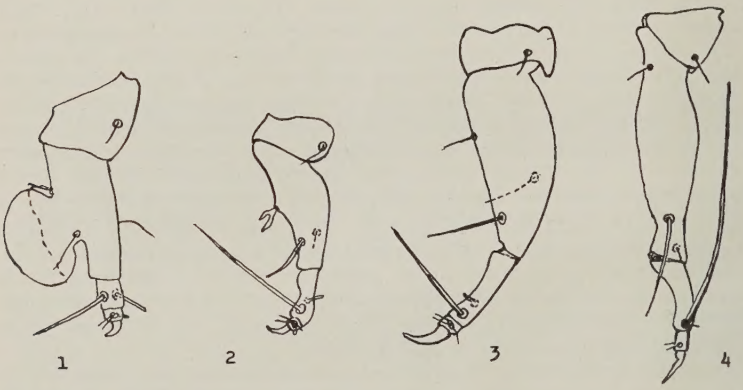
Ventral chaetotaxy: First propodosomal 2 long, distance behind apodeme I variable, often unequal even within a given specimen, ranging from against apodeme to 13 behind it; second propodosomal, 4 to 10 long, 11 from midline and 10 behind apodeme II; first hysterosomal situated in curve at anterior end of apodeme III, 22 long, reaching base of second

[1] Beer, R. E. 1954. A revision of the Tarsonemidae of the western hemisphere (order, Acarina), Univ. Kans. Sc. Bul. 36 (pt. II, no. 16): 1091-1387.

hysterosomal which is situated close to apodeme IV at a little more than half the length of apodeme IV from its anterior end, and 7 long.

Apodemes: Anterior median apodeme distinct for about the anterior half of the distance between the inner ends of apodemes I and II, continuing indistinctly almost to main body suture; apodeme II short of reaching midline by about one-fifth its length; transverse apodemes slightly bowed, each 20 long, the ends pointing cephalad and the inner ends 30 apart; anterior end of apodeme III curved posteromedially toward anterior end of apodeme IV, but not closing with it; area between apodeme III and IV open at anterior end; posterior median apodeme 60 long, distinct except for distance of about one-fifth its length near its anterior end which terminates, usually in the shape of a trident, slightly behind a point even with anterior end of apodeme IV.

Legs: Tarsus I, 10 long, with a long proximal annulated sensilla and seven normal setae; tibia I, 8 long, with two annulated sensillae, a tapering one, and five normal setae; tarsus II, with two annulated sensillae and four normal setae. Leg IV (fig. 1); femur 26 long, expansion 22 long, seta at proximal juncture of expansion 7 long, seta at distal juncture 10 long, seta on anterior margin 10 long; tibia plus tarsus 10 long and 7 wide, ventral tarsal seta 16 long, dorsal rod-like sensilla 9 long; claw 6 long.



Ventral view of leg IV of males. Fig. 1. *Steneotarsonemus paspali;* Fig. 2. *S. furcatus;* Fig. 3. *Hemitarsonemus cocosi;* Fig. 4. *H. lodici.* All drawings to same scale.

Genital papilla: Shape variable, usually about 31 long and 27 wide, but in some specimens 30 long and 31 wide, base emarginate; caudal two-fifths constricted.

FEMALE:—Body slightly brownish, with faint longitudinal grooves dorsad; 287 long from anterior end of capitulum (including palpi) to end of body, and 119 wide; capitulum 27 long (including palpi) and 34 wide, widest at about middle.

Dorsal chaetotaxy: First propodosomal 20 long, second 70 long, 26 from first propodosomal and situated just behind pseudostigmatic organ which

is 18 long (including pedicel 5 long) and 8 wide. Hysterosoma with six pairs of setae, the first two pairs near anterior margin, 16 and 9 long, distance between respective bases 109 and 48; third pair at posterior margin of segment two, 8 long and 60 apart; fourth and fifth pairs at posterior margin of third segment, outer pair at its lateral angle, inner pair 22 apart, both pairs 7 long; sixth pair near posterior outer margin of segment four, 15 long.

Ventral chaetotaxy and apodemes: First propodosomal 6 long, situated at about mid-length on apodeme I which is widened; second propodosomal close behind apodeme II, near its middle and 5 long; anterior median apodeme 43 long, not united with apodeme II, indistinct for about a quarter its length anterior to middle and again indistinct posterior to apodeme II; a pair of C-shaped rudimentary apodemes, often with one to three spurs, 6 across, 47 apart and 27 diagonally caudad of coxae II, the open part facing caudolaterally. First hysterosomal 26 long, medial to expanded anterior end of apodeme III, and situated close to its lower angle, second hysterosomal 7 long, situated on apodeme IV near its caudal end, anterior half of apodeme IV indistinct, curved cephalad, not reaching midline; posterior median apodeme absent; a pair of caudal seta 8 long.

Legs: Tibiotarsus 27 long with a distal, annulated sensilla, a group of three posteroproximal sensillae, the lower one tapering, the other two annulated and club-shaped, and nine normal setae; tibia II with four normal setae; genu II with two coarse setae and one normal seta. Leg IV, 46 long; subapical seta 27, apical seta 80 long.

HOLOTYPE:—Male, Coral Gables, Florida, 5 October, 1955, (D. De Leon) from *Paspalum* sp. Allotype, same data as for holotype and on same slide. Paratypes, 2 females and 2 males, a pair each on two slides, same data as for holotype. Additional specimens were collected 10 October, 1955, Coral Gables, Florida.

Steneotarsonemus furcatus, n. sp.

Steneotarsonemus furcatus may be distinguished from all other members of the genus by the presence of a coarse bifurcate seta on the posterior margin of femur IV of the male.

MALE:—Body brownish; length from anterior end of capitulum (including palpi) to posterior end of genital papilla 166, width 76, widest at coxae III; capitulum 22 long (including palpi) and 23 wide, widest at basal third, base not emarginate; genital papilla cordate in outline, 24 long, 23 wide.

Dorsal chaetotaxy: Propodosomal setae nearly in line, 10, 7, 19, and 13 long respectively, distance from preceding seta 7, 7, and 16 respectively. Humeral seta 12 long, situated at about twice its length from main body suture; second and third hysterosomals about 12 long, 9 anterior to secondary body suture, the second near side of body slightly anterior to the third, the bases of third 14 apart; fourth hysterosomal at middle of outer edge of basal third of genital papilla, 10 long; the humeral fine, the others coarse.

Ventral chaetotaxy: First propodosomal 4 long, 5 behind apodeme I and 4 from midline; second 5 long, 7 behind apodeme II and 9 from midline. First hysterosomal 11 long, its base situated in curve at anterior end of

apodeme III and touching it; second 4 long, its base situated at about mid-length of apodeme IV and touching it.

Apodemes: Anterior median apodeme distinct, extending to a point about even with inner ends of apodemes II; apodeme II short of reaching midline by 4 and with a semicircular expansion on anterior edge near inner end; transverse apodemes originating near sides of body, slightly bowed, inner ends 25 apart; anterior end of apodeme III curving posteromedially and almost closing with apodeme IV; area medial to apodeme IV fully open cephalad; posterior median apodeme distinct its full length, 44 long, terminating at a point about even with anterior end of apodeme IV.

Legs: Tarsus I, 12 long with an annulated proximodorsal sensilla and 7 normal setae; tibia I, 11 long with a proximodorsal annulated sensilla, two proximolateral sensillae on posterior side, the upper annulated, club-shaped, the lower tapering and 5 normal setae; tarsus II, 10 long, with 5 normal setae and two proximodorsal sensillae one behind the other, the proximal one annulated, club-shaped, the distal tapering; tibia II, 9 long, with four setae. Leg IV (fig. 2); femur 22 long with a coarse bifurcate seta or process at about mid-length of posterior face, the posterior ramus the longer and stouter, length of process 7; ventral seta of femur 10 long, dorsal seta 4 long; tibia 11 long and 6 wide with a ventral seta 27 long and a dorsal rod-like sensilla anterior to it; tarsus 3 long and 5 wide; claw 7 long.

FEMALE:—Body somewhat darker in colour than male; length from anterior end of capitulum (including palpi) to end of body 235, width 112; capitulum 30 long (including palpi), 28 wide, widest at basal third, base not emarginate; tracheal atria apparently sclerotized, usually crescent-shaped.

Dorsal chaetotaxy: First propodosomal situated at anterior lateral edge of propodosoma, 13 long; second 17 long, situated posteromedially to pseudostigmatic organ which is 12 long (including pedicel of 3) and 5 wide; six pairs of hysterosomals 7 to 10 long, the first fine, the others coarse.

Ventral chaetotaxy: First propodosomal 3 long, 3 behind apodeme I and 5 from midline; second 5 long, 3 behind apodeme II and 10 from midline. First hysterosomal 11 long, situated slightly medial to inner anterior end of apodeme III; second 5 long, situated on apodeme IV near its posterior end; a pair of caudal setae 5 long.

Apodemes: Apodeme I, 5 wide, anterior median apodeme narrow, distinct for a distance of 13 from apodeme I, indistinct and widening at inner ends of apodeme II and continuing slightly beyond their indistinct inner ends; transverse apodemes crescent-shaped, 23 across, the outer ends considerably anterior to inner ends which are 26 apart; apodeme III, 18 long; apodeme IV thin, 25 long, bent medially at middle, anterior end curving toward and stopping just short of anterior end of posterior median apodeme which is 24 long, indistinct and slightly expanded at middle third.

Legs: Femur I with a narrowly elliptic seta dorsad shorter than width of femur and with two normal setae; genu I, 13 long, with four setae, the proximal one short and coarse; tibiotarsus 20 long, with two large, annulated, club-shaped sensillae, two smaller sensillae lateral to proximal club-shaped sensilla, the upper annulated, club-shaped, the lower tapering, and 12 normal setae. Femur II with a short, coarse seta dorsad and two some-

what longer setae; genu II, 9 long, with two setae; tibia II, 9 long, with four setae; tarsus II, 11 long, with two proximodorsal sensillae, one annulated, club-shaped, the other tapering, and four normal setae. Leg IV, 43 long; sub-apical setae 23 long, apical seta 53 long.

HOLOTYPE:—Male, Coral Gables, Florida, 5 October 1955 (D. De Leon) from *Paspalum* sp. Allotype on same slide as holotype and same data. Paratypes, two males and a female, same data as for holotype. Additional specimens were collected 10 October 1955, same locality and host.

This species was found associated with colonies of *S. paspali.*

Hemitarsonemus cocosi, n. sp.

H. cocosi differs from the three other known species of *Hemitarsonemus* by the first two dorsal propodosomals of the male being sub-equal in length and somewhat less than one-third as long as the third propodosomal, by the relatively short ventral seta of tibia IV, and by other characters.

MALE:—Length from anterior end of capitulum (including palpi) to distal end of genital papilla 169, width 91; capitulum 29 long (including palpi) and 24 wide, widest near base; genital papilla 28 long and 26 wide, caudal half constricted, basal outline emarginate.

Dorsal chaetotaxy: Propodosomal setae 21, 18, 67, and 10 to 17 long respectively, the fourth finer than the others; distance from preceding seta 9, 8, and 1 respectively, the fourth nearly lateral to the third. Humeral seta 25 long situated somewhat less than its length from hysterosomal suture; the other hysterosomals 14, 17, and 11 long respectively, the second and third pair situated about half their length anterior to secondary body suture, their respective bases 65 and 39 apart; the fourth at basal third of genital papilla.

Ventral chaetotaxy: First propodosomal 7 long, its basal ring touching or nearly touching caudal edge of apodeme I, distance between bases 6; the second 8 long, 6 behind apodeme II, distance between bases 23. First hysterosomal 11 to 19 long, slightly nearer apodeme III than apodeme IV and near anterior end of area between apodemes III and IV; second 7 to 13 long.

Apodemes: Anterior median apodeme extending to transverse apodemes and indistinct in part nearest inner caudally directed portion of apodeme II; apodeme II with a somewhat semicircular expansion near inner end on anterior margin; transverse apodemes slightly curved and meeting, indistinct towards midline. Area between apodemes III and IV and area between apodeme IV and posterior median apodeme almost fully open at anterior end; anterior ends of apodemes III and IV each in order somewhat closer to main body suture than anterior end of posterior median apodeme.

Legs: Tarsus I, 11 long with a club-like, annulated, proximodorsal sensilla, a short, slender mediodorsal sensilla, and five normal setae; tibia I, 9 long, with an annulated, proximodorsal sensilla, a tapering one lateral to it and five normal seta. Tarsus II, 11 long, with an annulated proximodorsal sensilla and three normal setae; tibia II, 9 long, with four normal seta; genu II and femur II each with three setae. Leg IV (fig. 3); femur 31 to 37 long (measured in a straight line from outer distal edge of coxa to outer base of tibia), its dorsal seta fine, 10 to 25 long, proximal seta of

posterior margin 8 long, distal seta 19 long; tibia 22 long and 7 wide, its dorsal rod-like seta 5 long, ventral seta 27 long; tarsus 4 long and 6 wide; claw 10 to 16 long, (measured from its outer base in a straight line).

FEMALE:—Not known.

HOLOTYPE:—Male, Coral Gables, Florida, 16 May, 1955, (D. De Leon) from *Cocos nucifera*. Paratypes, four males, same date as for holotype.

Hemitarsonemus lodici, n. sp.

The male of *H. lodici* may be distinguished from the other species of *Hemitarsonemus* by the first propodosomal seta being much longer than the second, and the second being about as long as the first hysterosomal; although tibia IV is scarcely three times as long as wide the mite clearly belongs to this genus. The female may be distinguished by the spiracle being at the base of the second propodosomal seta and apodeme II extending from coxa II to the juncture formed by the union of the anterior median apodeme with the transverse apodemes. The mite appears to be most closely related to *H. peregrinus* Beer.

The females and larvae carry about on their backs a covering made up of particles of organic matter and sand; the males are frequently without this covering. Their feeding appears to be confined to the lower leaf surface.

MALE:—Body diamond-shaped, widest just below the middle, strongly convex dorsally; light amber in color. Length from anterior end of capitulum (including palpi) to distal end of genital papilla 144, width 83; capitulum 30 long (including palpi), 28 wide, widest near base; genital papilla 25 long, 23 wide, basal outline emarginate.

Dorsal chaetotaxy: Propodosomal setae 31, 19, 83, and 36 long respectively, distance from preceding seta 2, 10, and 2 respectively. Humeral seta 22 long, 10 to 27 from hysterosomal suture, second, third, and fourth hysterosomals coarse, 35, 15, and 13 long respectively, the fourth near margin of body at side of genital papilla; the third directly anterior to fourth on second body segment near its posterior margin; second about in line with first and third, somewhat nearer the first.

Ventral chaetotaxy: First propodosmal 7 long, 3 behind apodeme, distance between bases 16; the second 5 long, 3 behind apodeme II, distance between bases 35. First hysterosomal 4 long, situated in curve near anterior end of apodeme III; the second 6 long, situated at about midlength of apodeme IV, and close to it.

Apodemes: Anterior median apodeme extending from apodeme I to transverse apodemes, the caudal two-fifths usually indistinct, especially the anterior part; apodeme II practically parallel with apodeme I, not reaching midline by about one-fifth its length; apodeme III extending to a point about 15 from midline, sub-parallel to apodeme IV which curves fairly evenly from coxa IV to a point just short of midline and slightly anterior to distal end of posterior median apodeme; posterior median apodeme 29 long. In some specimens one or two secondary apodemes or folds extend from apex of coxa III anterolaterally to near margin of body.

Legs: Legs slender; tarsus I, 31 long, 6 wide, with a mediolateral annulated rod-like sensilla and five normal setae; femur I with two stout setae ventrad and two normal setae; tarsus II, 25 long, with a proximal,

annulated rod-like sensilla and four normal setae. Leg IV (fig. 4); femur 45 long (measured from outer distal end of coxa to outer base of tibia), 13 wide, proximoventral seta 4 long, distoventral seta 19 to 27 long, dorsal seta 4 long; tibia 16 long, 5.5 wide, ventral seta 44 to 61 long, dorsal seta 2 long; tarsus 4 long, 3 wide; claw 6 long, nearly straight.

FEMALE:—Ovate, widest slightly anterior to middle, tapering rapidly posteriorly, strongly convex dorsad; brownish; length 176, 126 wide, about 80 from dorsum to venter; capitulum about 32 long (including palpi), 33 wide. In mounted specimens the anterior margin of propodosoma usually extends well beyond tips of palpi, the first propodosomal on the anterior margin, the second on the anterolateral margin at a point about even with the anterior end of the capitulum when it is fully retracted. In live specimens the propodosoma apparently covers about a third of the capitulum. Spiracle at anterior margin of base of second propodosomal. Pseudostigmatic organ 13 long (including pedicel of 5), 7 wide.

Dorsal chaetotaxy: First propodosomal 32 to 40 long, distance between bases 26; second 84 long, distance between bases 48, distance from first 8 to 12. Hysterosoma with three pairs of setae, the first 20 long, situated near the middle of body; second 26 long, near side of body and near caudal margin of penultimate segment; the third 29 long, 16 apart and about on a line with second.

Ventral chaetotaxy and apodemes: First propodosomal 4 long, 1 behind apodeme I, distance between bases 17; second propodosomal 6 long, on or close behind apodeme II, distance between bases 48; anterior median apodeme extending to transverse apodemes, often with a knob or a pair of spurs at about midlength, caudal half somewhat indistinct; apodeme II with caudal third indistinct, uniting with anterior median apodeme just anterior to or at juncture with transverse apodemes; transverse apodemes generally distinct, united at midline (the inner ends usually directed slightly forward a short distance before meeting), bent at about their midlengths, the lateral portions extending forward almost to outer posterior angles of coxae II; apodeme III extending anteromedially for about half its distinct length, then more medially, the remaining part expanded, indistinct, and usually uniting with arm of fork of posterior median apodeme; apodeme IV straight to bisinuate, 14 to 18 long, uniting or nearly uniting with posterior median apodeme about 5 behind fork; posterior median apodeme 20 long to base of fork, interrupted at midlength, a V-shaped fork at anterior end, arms of fork about 8 long. First hysterosomal anterior to indistinct part of apodeme III, 3 long, distance between bases 11; second on caudal end of apodeme IV, 4 long.

Legs: Tibiotarsus with a distolateral annulated sensilla, a longer, slender, apparently sensory seta adjacent to it and nine tactile setae; tarsus II with a distolateral annulated sensilla and four tactile setae; leg IV, 37 long, terminal segment 13 long, preapical seta 14, apical seta 16 long.

LARVA:—Oval, strongly convex dorsad, pearly white, 61 long, 33 wide. First propodosomal 15 long; second 32 long, a seta or a seta-like pseudostigmatic organ 7 long arising beside it. Second body segment narrow, a ventral seta about 4 long, situated just anterior to it near lateral margin of body; a pair of anteriorly directed spine-like setae 7 long, about 7 anterior to secondary body suture, distance between bases 4; two pairs of sub-

equal, dorsally directed spine-like setae about 5 long forming a transverse row on fourth body segment; two pairs of spine-like caudal setae, outer 4 long, inner 7 long.

HOLOTYPE:—Male, Coral Gables, Florida, 21 February, 1956, (D. De Leon) on *Psychotria undata.* Allotype same data as for holotype and on same slide. Paratypes 10 males, 14 females and 5 larvae, same data as for holotype. A few females and larvae were collected from *Pithecolobium guadalupense, Dipholis salicifolia,* and *Citharexylum fruticosum,* Coral Gables, 28 February, 1956.

The holotypes of these four species will be deposited in the U. S. National Musuem, and paratypes in the University of Florida collections, Gainesville.

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BREVIPALPUS FLORIDIANUS, A NEW MITE FROM SOUTHERN FLORIDA (ACARINA: TENUIPALPIDAE)

DONALD DE LEON
Coral Gables, Florida

The genus *Brevipalpus* is world wide in distribution and is a large one containing about 50 described species, over half of which have been found in this country. Nine species have been found in Florida; of these, one, *phoenicis* (Geij.), cosmopolitan in distribution according to Pritchard and Baker,[1] is a common pest on a wide variety of plants. In South Florida, I have taken it from mango, avocado, coconut (it is often abundant on the seedlings), maple, mahogany, *Caladium, Hibiscus, Cordyline,* and more than fifty additional hosts. Two others of the species found in Florida, *B. linki* Baker, on live oak, and *B. floridianus,* n. sp., on sweet bay, have not been found outside the State and both appear to be limited to a single host.

Brevipalpus floridianus, n. sp.

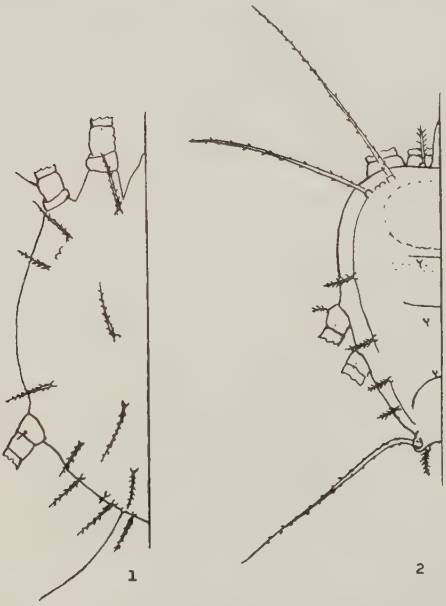
B. floridianus belongs to the group of mites with six dorsolateral hysterosomals, two setae on the terminal palpal segment, and a single distal sensilla on tarsus I of the female. It is readily distinguished from all others in this group by the area between the anterior and posterior medioventrals being fully and distinctly covered with areolae. The nymph is also distinctive; dorsolaterals 2, 3, and 8 are about two-thirds the length of the body and the remaining ones are relatively long and spiculate.

FEMALE:—Body ovate, reddish. Rostrum extending to a point about even with middle of femur I; rostral shield ending at a point slightly behind base of femur I, bilobed. Propodosoma dorsad evenly covered with areolae irregularly circular to oval in outline, the great majority more or less of same size (about 3 to 4 microns in short diameter); towards sides areolae somewhat larger and oval ones more numerous. Areolar pattern of hysterosoma somewhat similar to propodosoma but areolae more irregular in shape and larger; areolae in area between dorsocentrals 2 and 3 much wider than long, many extending nearly full width of area; caudal of this area and in some specimens anterior to this area, areolae become successively narrower. Ventrad, areolar pattern similar to dorsal propodosomal pattern and covering practically entire surface including area between anterior and posterior medioventrals; areolae of ventral plate predominantely wider than long in caudal mid-area. First pair of dorsal propodosomals obovate, about as long as distance between bases; second and third pairs small, narrowly elliptic; hysterosoma with six pairs of serrate, subequal, narrowly elliptic to oval dorsolaterals, distances between respective bases of 1 to 5 much greater than setal lengths, distance between 5 and 6 about equal to their lengths; dorsocentrals broadly oval, serrate, first pair about one-third as long, and second and third pairs about half as long as transverse distance between respective bases. One pair of pores present. Posterior medioventrals long, anterior pair short, Terminal palpal segment with two setae and a sensilla. Legs slender. Dorsal seta of femur I about

[1] Pritchard, A. E., and E. W. Baker. 1952. The false spider mites of California (Acarina: Phytoptipalpidae). Uni. Calif. Publ. Ent. 9(1): 1-93.

three-fourths width of femur, broadly elliptic, serrate; dorsal seta of femur II about one-half width of femur, narrowly elliptic, serrate; dorsal setae of patellae and tibiae I and II almost setiform, faintly serrate; tarsus II with a posterodistal sensilla about as long as width of tarsus; femur IV slightly more than three times as long as wide. Length including rostrum 291, width 162 microns.

MALE:—Resembles female, but hysterosoma without transverse areolae, and dorsocentrals somewhat smaller. Dorsolateral hysterosomals slender, strongly pectinate; 1 to 4 subequal in length (about 22 microns); 2, 3, and 4 about as long as distance between adjacent bases, 5 and 6 somewhat shorter than 4 and less than their length apart. Tarsus II with an anterior and a posterior distal sensilla. Length including rostrum 284, width 132 microns.



Larva and deutonymph of *Brevipalpus floridianus*, n. sp. Fig. 1. Dorsum of larva; Fig. 2. Dorsum of deutonymph. Scale of drawing of larva twice that of deutonymph.

DEUTONYMPH: — (Fig. 2); mottled grey, black and red. Dorsocentrals minute. Dorsolaterals 2, 3, and 8 about one-half to two-thirds length of body, sparsely, weakly spiculate; 1 narrow, about 33 microns long, spiculate, the remaining setae about one-half to two-thirds as long as 1 and spiculate; seta 8 arising from a prominent lateral protuberance, seta 9 apparently missing; setae 3 and 4 more variable in length than others — in a few specimens seta 3 about a third as long as 2, and in some specimens seta 4 two to three times as long as 5.

LARVA:—(Fig. 1); red, dorsal body setae spiculate, 17 to 37 microns long, except dorsolateral 7 which is minute and 9 which is more than twice as long as 10 and extremely slender.

HOLOTYPE:—Female, Coral Gables, Florida, 15 November, 1955, (D. De Leon) from *Persea (Tamala) borbonia*. Allotype: same data as for holotype and on same slide. Paratypes: 9 males, 10 females, 10 nymphs, and 10 larvae, November 8 to December 20, 1955, other data as for holotype. The holotype and allotype will be deposited in the U. S. National Museum and paratypes in the University of Florida collections, Gainesville.

LIFE CYCLES OF FOUR SPECIES OF LADYBEETLES[1]

MARTIN H. MUMA[2]

As part of an investigation into the factors contributing to the natural control of insects and mites injurious to citrus in Florida, the life cycles of several predators have been determined. The present paper deals with the life cycles, under laboratory conditions, of four species of ladybeetles; *Exochomus marginipennis childreni* Muls., *Microweisea coccidivora* (Ashm.), *Stethorus utilis* Horn and *Delphastus pusillus* (Lec.).

Test tubes and petri dishes were used as rearing cages. Cabinets maintained at 80°F.—the mean June-July temperature for the past 10 years—were used for the incubation and development. The known or suspected favored host was utilized as food for each species.

Exochomus marginipennis childreni Muls.

Exochomus childreni Mulsant, 1850, Ann. Soc. d'Agric. Lyon, Vol. 2, p. 1037

Adults of this species are broadly oval beetles that vary from one-tenth to one-eighth of an inch in length. The head, thoracic segments and legs are black, with the abdomen and elytra bright orange to red. The elytra is distinctively marked with a connected pair of black, ovate spots on the posterior margin. The slender, elongate-oval eggs are light, lemon-yellow, and were laid singly or in pairs under the armors of the scale insects provided as hosts during the study. Larvae in the first and second stadia are light yellow with grey to brown sclerites and long, slender, black spines arising from senti. Third and fourth instar larvae are dusky-yellow with the spines, senti and sclerites dark brown to black, and the first abdominal segment bright orange on the margins. The new pupa is bright yellow, but soon darkens to a dark brown, marked with a row of light triangular spots down the midline, a light yellow median stripe on the prothorax, a pair of light, lateral, transverse bars on the mesothorax and light yellow to orange margins on each abdominal segment.

Florida red scale, *Chrysomphalus aonidum* (L.), was chosen as the food host for the life cycle study on this beetle. On citrus the species has also been observed to feed on purple scale, *Lepidosaphes beckii* (Newm.), and the green citrus aphid, *Aphis spireocola* Patch, but heaviest infestations have been associated with Florida red scale.

Data accumulated on the life cycle of this ladybeetle are given in Table 1. Because of the uncommon occurrence of the species on citrus, only a few gravid females were obtained, and few eggs were produced. Mortality was relatively high, but complete data on development was obtained for 10 individuals.

The life cycle of the species approximates that of the average ladybeetle, varying from three to nine weeks, with an average of about five. It is possible that the species would develop more rapidly on the green citrus aphid. Inadequate numbers of ladybeetles have prevented further study.

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TABLE 1.—Summary of Life Cycle of *Exochomus marginipennis childreni* Muls., in the Laboratory at 80°F., When Fed Florida Red Scale, *Chrysomphalus aonidum* (L.).

Stage	No. Individuals Total	Died	Lived	No. Days to Develop Max.	Min.	Mean	Percent Mortality per Stage
Egg	28	6	22	8	6	6.6	21.4
First Instar	22	6	16	9	2	5.0	27.3
Second Instar	16	0	16	6	2	4.1	0.0
Third Instar	16	2	14	16	3	5.5	12.5
Fourth Instar	14	3	11	16	3	8.7	21.4
Pupa	11	1	10	7	5	6.1	9.9
Total		18	10	62	21	36.0	64.3
Adult Longevity	10	10	0	16	5	9.8	

Microweisea coccidivora (Ashm.)

Hyperaspidius coccidivora Ashmead, 1880, Orange Insects, p. 10.

Adults of this ladybeetle are ovate and vary from one-twentieth to one-sixteenth of an inch in length. The legs, ventral sclerites, head and prothorax are pale brown to mahogany red; the elytra is dark brown to black, marked with a wide brown to mahogany-red transverse band that in some specimens is interrupted to form a series of three spots. The ovate eggs are light yellow when laid, but soon darken to pink or orange. During the life cycle study reported here, eggs were laid singly or in pairs under scale armors. Newly hatched larvae are pale-yellow with pale legs, a brown head, and a pair of dark sub-parallel sclerites on the dorsal surface of the prothorax. Later instars are a pinkish-grey with a brown head, light brown legs and with the dark prothoracic sclerites forming a pair of parentheses. The pupae are dark grey and provided with numerous dark setae.

TABLE 2.—Summary of Life Cycle of *Microweisea coccidivora* (Ashm.), in the Laboratory at 80°F., When Fed Florida Red Scale, *Chysomphalus aonidum* (L.).

Stage	No. Individuals Total	Died	Lived	No. Days to Develop Max.	Min.	Mean	Percent Mortality per Stage
Egg	55	32	23	10	6	8.2	58.2
First Instar	22	8	14	5	2	4.2	36.4
Second Instar	14	8	6	4	2	3.2	57.1
Third Instar	6	3	3	8	3	5.0	50.0
Fourth Instar	4	1	3	7	6	6.5	25.0
Pupa	3	1	2	5	5	5.0	33.3
Total		53	2	39	24	32.1	96.3

Although little is known of the food habits of this species, the beetles are invariably associated with purple or Florida red scale infestations. The latter scale was chosen as food for the beetles because the largest populations of the species have, to date, been found in infestations of Florida red scale.

Table 2 summarizes the life cycle data accumulated for this ladybeetle. Exceptionally high mortality occurred during the study. Although much of this mortality was due to handling of the eggs, it is possible that purple scale or a combination of purple and Florida red scale may be a more satisfactory food. The life cycle obtained with Florida red scale approximates that of the average ladybeetle but may be different on other foods. Additional life cycle studies are planned for this species.

Stethorus utilis Horn

Stethorus utilis Horn, 1895, Trans. Amer. Ent. Soc., Vol. XXII, p. 107.

Adult beetles are ovate in outline with the elytra truncate posteriorly and measure about one-sixteenth of an inch in length. They are dark brown to black with the appendages pale brown to yellow and are heavily clothed with dark setae. The elongate eggs are pale yellow to cream colored but darken to pink shortly after they are laid. During the life cycle study reported here, the eggs were laid singly on their sides in mite colonies. First and second instar larvae are pale cream with the head and thoracic segments light brown. Later instars are brownish-grey with a narrow median stripe, and the first and last two segments of abdomen light. The new pupa is light but soon darkens to a dark brown or black and is provided with numerous elongate curved setae.

Populations of this ladybeetle are nearly always associated with infestations of the six-spotted mite, *Eotetranychus sexmaculatus* (Riley). For this reason, this mite was used as food during the life cycle study.

Table 3 gives a summary of the life cycle data accumulated for this species. Owing to their small size, several of the early instar larvae escaped from the petri dishes and were recorded as deaths. Otherwise, mortality due to handling was relatively low.

TABLE 3.—Summary of Life Cycle of *Stethorus utilis* Horn, in the Laboratory at 80°F., When Fed Six-Spotted Mite, *Eotetranychus sexmaculatus* (Riley).

Stage	No. Individuals			No. Days to Develop			Percent Mortality per Stage
	Total	Died	Lived	Max.	Min.	Mean	
Egg	30	0	30	5	3	3.7	0.0
First Instar	30	4	26	3	1	1.8	13.3
Second Instar	26	3	23	3	1	1.4	11.5
Third Instar	23	1	22	3	1	1.6	4.3
Fourth Instar	22	4	18	6	1	2.8	18.2
Pupa	18	0	18	3	3	3.0	0.0
Total		12	18	23	10	14.3	40.0

This ladybeetle is the only native species reared to date which has an average life cycle of approximately two weeks. The two-week period recorded probably would be even less under natural conditions and in the presence of abundant food. Additional life-cycle studies are planned for the species, using the citrus red mite, *Metatetranychus citri* (McG.), as food.

Delphastus pusillus (LeC.)

Oeneis pusillus LeConte, 1852, Proc. Acad. Nat. Sci. Phila., Vol. VI, p. 135.

Adult beetles of this species are broadly ovate and about one-sixteenth of an inch in length. They are dark brown to black with the head, prosternum and venter of the abdomen somewhat lighter. The elongate translucent eggs are laid singly on their sides on leaves infested with the eggs, larvae and nymphs of whiteflies. Newly hatched and second instar larvae are an off-white and provided with numerous short pale setae. The third and particularly fourth instar larvae are provided with numerous small dark senti and setae which give the larvae a grey-banded appearance. Pupae are white to light grey with numerous pale setae.

Although this ladybeetle has been recorded feeding on several species of whitefly, the cloudy-winged whitefly, *Dialeurodes citrifolii* (Morg.), was used as food for the life cycle study because of its common occurrence.

Table 4 summarizes the life-cycle data accumulated for this species. Large mortalities due to handling occurred in the first instar larvae, but sufficient material was reared to obtain adequate data.

TABLE 4.—Summary of Life Cycle of *Delphastus pusillus* (LeC.), in the Laboratory at 80°F., When Fed Cloudy-Winged Whitefly, *Dialeurodes citrifolii* (Morg.), and Citrus Whitefly, *Dialeurodes citri* (Ashm.).

Stage	No. Individuals			No. Days to Develop			Percent Mortality per Stage
	Total	Died	Lived	Max.	Min.	Mean	
Egg	102	15	87	5	3	3.6	14.7
First Instar	87	59	28	4	1	2.3	67.8
Second Instar	28	4	24	3	1	2.0	14.3
Third Instar	24	2	22	3	1	1.9	8.3
Fourth Instar	22	3	19	10	3	5.5	13.6
Pupa	19	0	19	5	4	4.4	0.0
Total		83	19	30	13	19.7	81.4
Adult Longevity	15	15	0	47	1	26.7	

The 20-day life cycle obtained for this ladybeetle may be shorter with other species of whiteflies as food, but inadequate food sources have prevented additional study. Life-cycle studies on this predator will probably not be continued because of the minor importance of whiteflies on Florida citrus.

REPORT ON A COLLECTION OF MALLOPHAGA, LARGELY MEXICAN (PART II)

M. A. Carriker, Jr.

(Continued from p. 84, Vol. 39, No. 2)

Brüelia saltatora, n. sp.
(Figures 64, 65 and 66a)

Types, male and female adults, from *Saltator coerulescens vigorsii* G. R. Gray, collected by R. Newman at Xilitla, S. L. P., México, January 22, 1947 (in L. S. U. M. Z. coll.).

Diagnosis.—Resembles somewhat *B. eustigma* and *B. interposita* (Kell.), but is considerably smaller than the former (female: 1.71 x .51 against 1.84 x .62) and larger than the latter (female: 1.71 x .51 against 1.41 x .41). The head also differs in size and proportion (female: .458 x .456 against .42 x .45 *(eustigma)* and .31 x .34 *(interpositus)*. The postantennal portion of the head is quite quadrangular in shape, tapering sharply to the frons, while in both *eustigma* and *interpositus* the whole head is triangular in shape.

The type of *eustigma* supposedly came from *Trochilus anna* (California), which I doubt very much, inasmuch as in all of my collecting I have never taken Brüelia on a hummingbird. Very likely the true host is some species of Fringillidae. The host of *B. interpositus* is likewise open to doubt, supposedly being *Dendroica bryanti* (Panama), though in my large series of this genus there is not a single specimen taken on any species of warbler.

Unfortunately, all of the material of this new species is in very poor condition. Many details are not clearly visible, including the abdominal sclerites and the male genitalia. Consequently there may be some slight errors in the figures. The thoracic sternites (see figure) are clearly visible and are of a type not commonly seen. This chain of hyaline sclerites extends from the posterior portion of the pterothorax to the oesophageal sclerite of the head. On the sternal side of the temples are a series of three, connected curving lines (see figure) which are present in all of the specimens of both sexes and which I have not seen in other species of the genus. I have a single female of *Brüelia* from *Saltator atriceps* (Mexico), which is very similar to *saltatora* in general appearance, but the structure of the anterior portion of the head is quite different, and the temples are more convex, as well as the sides of the preantennal portion of the head.

B. cedrorum (Piaget) from *Bombycilla cedrorum* is also of the same type as *saltatora*, as well as several other species from Old World hosts, but apparently they all differ in various details. The new species is represented by the female holotype, male allotype and 2 male and 2 female paratypes. Measurements are given with following species.

Brüelia melanococca abbasi, n. subsp.
(Figures 66b and 67)

Type, female adult, from *Thraupis abbas* (Lichtenstein), collected by R. Newman at Xilitla, S. L. P., México, January 27, 1947 (in L. S. U. M. Z. coll.).

Diagnosis.—This is one of a large group of very closely related forms parasitic on the Neotropical Thraupidae and some of the tanagerlike finches, such as *Saltator* (see *saltatora*). In my own collection there are specimens from seven genera of tanagers which are all undoubtedly conspecific with *melanococca* (Carriker), while some may not be even subspecifically distinct. *B. ptilogonys* (Carriker) also falls into this group, but it has a longer head than *melanococca*, longer than wide (female: .38 x .37 against .38 x .39).

B. m. abbasi differs from *melanococca* chiefly in the much smaller head (.337 x .358 against .38 x .39), shorter body and slightly wider abdomen (1.47 x .48 against 1.65 x .46). Unfortunately the type and only specimen of *melanococca* was accidently lost several years ago when it was demounted for clearing, but the original description and figure are ample for its identification. The males are apparently very scarce, since there are only two in my series of this group, and there are none in the large series of *abbasi*. The genitalia of the two males examined (from different genera of hosts) are very similar, and very close to those of *saltatora*, n. sp.

B. brasiliensis (Giebel) from *Tanagra brasiliensis* undoubtedly belongs to this group and may possibly be conspecific with *melanococca*, but the description is insufficient to warrant a decision. I have specimens from *Tangara vassori* which are very similar to *abbasi*. However, there are several statements in Giebel's description which do not agree with either *melanococca* or *abbasi*. He says: "the last three segments of the antennae equal in length, the prothorax with sides very slightly convex," while in the *melanococca* group we have the 3rd and 4th segments of antennae shortest and equal and the 5th longer, while the sides of the prothorax are decidedly convex. His description of the markings of head and body also disagrees, but the type and only specimen may have been immature.

The distinguishing characters of *melanococca* and its closely related allies are: head triangular, more or less as long as wide, with sides convex and occipital margin *transverse* and with temples decidedly angulated (see figure); frons narrow; the preantennal carinae are broken near anterior end; the anterior plate is very small and wider than long; the buccal cavity is very small, but the canal is quite wide.

The pterothorax is sharply angulated medially on posterior margin, is much wider than first abdominal segment, and has 5 rather long setae on each side in lateral portion. The abdomen is elongated oval (female), with dorsal portion of pleurites pitchy black and narrower than the sternal portion (see figure). The tergites are narrowly separated medially and are very faintly chitinized; the sternites are continuous medially but widely separated from the pleurites, are more deeply colored posteriorly, and are not visible in segment I, and are very faint in II; the genital sternite is characteristic and quite large, covering segments VI and VII and anterior portion of VIII, with posterior margin convex and sparsely set with short, fine setae (see figure). The legs (not shown in figure) are short and stout, with narrow, pitchy margins and fairly strong claws. The thoracic sternites are unique and seem to be a good character for separating the subspecies. This race of *melanococca (abbasi)* is represented by the female holotype and 8 female paratypes, also 1 nymph.

Fig. 64. *Brüelia saltatora*, n. sp. ♀, entire body
Fig. 65. *B. saltatora*, n. sp. ♂, genitalia
Fig. 66a. *B. saltatora*, n. sp., thoracic sternites
Fig. 66b. *B. melanococca abbasi*, n. subsp., thoracic sternites
Fig. 67. *B. melanococca abbasi*, n. subsp. ♀, entire body
Fig. 68. *Carduiceps eroliae*, n. sp. ♀, body complete, except median abdominal segments
Fig. 69. *C. eroliae*, n. sp. ♂, genitalia
Fig. 70a. *C. pusillus*, n. sp., apical segments of abdomen
Fig. 70b. *C. eroliae*, n. sp. ♂, apical segments of abdomen
Fig. 71. *C. pusillus*, n. sp. ♀, body, except median abdominal segments
Fig. 72. *C. pusillus*, n. sp. ♂, genitalia
Fig. 73. *Anatoecus autumnalis*, n. sp. ♂, entire body
Fig. 74. *A. autumnalis*, n. sp. ♂, genitalia

MEASUREMENTS OF THE MALE AND FEMALE TYPES OF *B. saltatora* AND FEMALE OF *B. m. abbasi.*

	G. saltatora				*B. m. abbasi*	
	Male		Female		Female	
	Length	Width	Length	Width	Length	Width
Body	1.33	.....	1.71	.....	1.49	.....
Head (at clavi)	.....	.326	.....	.37	.....	.31
Head (at temples)	.423	.434	.458	.456	.369	.375
Prothorax	.12	.24	.13	.26	.14	.217
Pterothorax	.155	.35	.152	.39	.155	.31
Abdomen	.716	.477	1.04	.51	.95	.456
Antennae	.195	.04	.20	.043	.152	.03
Basal plate	.19	.13				
Paramers	.06	.075				
Endomera	.08	.04				

Brüelia biocellata nigropicta (Carriker), 1901

Nirmus biocellatus nigropicti Carriker, Jour. New York Ent. Soc. 10, p. 219; pl. 21, fig. 1. Host: *Pica pica hudsonia.*

Brüelia biocellata (Piaget), 1880, Pediculines, p. 666, pl. 55, fig. 2. Host: *Pica leucoptera,* Hopkins & Clay, 1952, p. 54.

This subspecies of *biocellata* (Piaget) was reduced to a synonym of that species by Hopkins and Clay in the 1952 Checklist of Mallophaga.

It is true that in appearance the two insects are very similar, with strikingly unusual body markings, but apparently the measurements were not taken into consideration when the race was reduced to synonomy.

Piaget did not see the female, his description, figure and measurements having been taken from the male. On size alone the two forms are clearly separable, and possibly the male genitalia will show differences. I have not seen specimens of *biocellata.*

MEASUREMENTS OF MALES OF *biocellata* AND *nigropicta.*

	biocellata		*nigropicta*	
	Length	Width	Length	Width
Body	1.50	....	1.93	....
Head	.46	.47	.542	.526
Thorax	.32	.38	.303	.51
Abdomen	.83	.61	1.17	.75

The above measurements of *biocellata* are taken from Piaget, while those of *nigropicta* are made from the type. It may also be noted that the head is wider than long in *biocellata* and that the pterothorax in *nigropicti* is almost as wide as head, but much narrower in *biocellata;* the abdomen is very much longer and wider in *nigropicti.*

Two females of this species were taken on *Pica pica hudsonia* (Sabine),

collected by D. S. Farner at Hamilton, Montana, July, 1945, and are in the collection of the Louisiana State University Museum of Zoology.

Genus *Carduiceps* Clay & Meinertzhagen, 1939

Until quite recently little has been published concerning this genus. In October, 1953, Col. Emerson [8] described a new species, *C. lapponicus*, from a European host (*Limosa l. lapponica*), and gave figures of the genitalia of three other known species (*complexivus, cingulatus,* and *scalaris*).

In January, 1954, Mr. Timmermann published a review of the genus,[9] but apparently had not seen Col. Emerson's paper of the previous October, since no mention is made of *C. lapponicus*. Both authors agree that the species of the genus are very uniform in appearance, with differences between them small, and that the male genitalia are the best character for distinguishing the different species.

The type of the genus is *C. complexivus* (Kell. and Chap.) whose host is *Crocethia alba*. Timmermann would make *complexivus* a synonym of *C. zonaris* (Nit.), from *Erolia minuta*. He also places populations from *Erolia temmincki, E. minutilla, E. testacea, Calidris canutus, Ereunetes mauri,* and *E. pusillus* all under *C. zonaris* (Nit.) but says the "different populations are not absolutely identical."

In addition to the two species of the genus described below, I have specimens in my own collection from the following hosts: *Crocethia alba, Calidris canutus rufus, Arenaria interpres, Micropalama himantopus, Charadrius semipalmatus, Erolia melanotos, E. minutilla,* and *E. alpina sakhalina*. I have not made a minute study of the above series, but a casual examination shows that there are many small differences between the specimens from the different hosts in detail of head structure, proportionate size of various portions of body, marking of the abdomen, and the male genitalia. Apparently some will be found to be conspecific with others, but I would not care to say that there are any two which could not be easily separated subspecifically.

Timmermann states that the differences between *C. complexivus* (Kell. & Chap.) and *C. zonarius* (Nit.) are very small, yet admits that the difference in shape of the endomera are sufficient for subspecific distinction, "if one wished to preserve that name [*complexivas*]." Personally, I am very much in favor of preserving the name *complexivus*, especially since it represents the genotype of *Carduiceps*, even if it should have to be reduced to a subspecies of *zonaris* (Nit.).

To the list of shore birds given by Timmermann, from which *Carduiceps* has been recorded, I can add *Charadrius semipalmata* and *Arenaria interpres*, and confirm its presence on *Micropalama* (1 female).

Carduiceps eroliae, n. sp.

(Figures 68, 69 and 70b)

Types, male and female adults, from *Erolia fuscicollis* (Vieillot), collected by D. S. Farner at Lawrence, Kansas, May 21, 1947 (type in L. S. U. M. Z. coll.).

[8] Proc. Ent. Soc. Wash. 55(5): 209.
[9] Ann. Magazine of Nat. History, Ser. 12, VII: 40.

DIAGNOSIS.—Differs from *D. complexivus* in shape of thoracic segments, in carinae of the tergites, and in the male genitalia.

The head measurements are the same as in *complexivus;* the prothorax has the sides more rounded and is slightly narrower (female, .153 against .18); the pterothorax is narrower (female, .225 against .29); the abdomen measures 1.09 x .37 against 1.01 x .41.

In the female the dark-colored transverse bands across the tergites are practically absent, there being merely a slight indication of their presence at each side of abdomen (see figure), while in *complexivus* they are of uniform width and density across the abdomen in both sexes and on all segments. In the male of *eroliae* these tergal bands are present but differ in shape from those of the male of *complexivus.* In segment VII this band is practically as in *complexivus,* but in VI it curves strongly forward in median portion (see figure), while in *complexivus* it is transverse. In the remaining segments (I - V) the bands are transverse in both species, but considerably narrower in *eroliae,* where they are of uniform width across the segment, instead of wider in median portion of abdomen, as in *complexivus.*

The male genitalia differ in several details. The basal plate is shorter but of same width (.158 x .09 against .22 x .087). The attachment of the endomera is distinct, the lateral carinae of the basal plate dividing at some distance from the posterior end of the plate, the inner branch forming the attachments for the endomera, the outer for the paramers. In *complexivus* the attachment is very similar to that of *pusillus* (n. sp. described below).

The paramers are of slightly different shape, with decidedly different marginal carinae.

The endomera is slightly shorter and narrower than in *complexivus* (.071 x 0.46 against .08 x .05), while the marginal carinae are very much narrower and of entirely different shape, especially towards the base, where they widen strongly in *complexivus;* the tip of the endomera is wider in *eroliae,* with slightly more prominent lateral hooks; the seminal duct is shorter, with lesser amount extending beyond the basal plate.

The species is represented by the male holotype, female allotype and 1 male and 3 female paratypes.

MEASUREMENTS OF THE TYPES OF *Carduiceps eroliae*

	Male		Female	
	Length	Width	Length	Width
Body	1.39	.....	1.65	.....
Head	.33	.27	.37	.295
Prothorax	.11	.152	.12	.153
Pterothorax	.15	.206	.163	.225
Abdomen	.87	.38	1.095	.37
Antennae	.105	.....	.108	.....
Basal plate	.158	.09		
Paramers	.076	.02		
Endomera	.071	.046		

Carduiceps pusillus, n. sp.
(Figures 70a, 71 and 72)

Types, male and female adults, from *Ereunetes pusillus* (Linné), collected by G. H. Lowery at Lawrence, Kansas, May 15, 1947 (in L. S. U. M. Z coll.).

Diagnosis.—Very close to *eroliae* in measurements, differing as follows: length (male) 1.35 against 1.39; (female) 1.59 against 1.65; pterothorax (male) .13 x .195 against .15 x .206, (female) .152 x .205 against .163 x .225; abdomen (male) .835 x .305 against .87 x .38, (female) 1.04 x .37 against 1.095 x .37. Paramers longer and narrower (.081 x .015 against .076 x .02); endomera narrower (.073 x .036 against .076 x .046).

In the head both dorsal and ventral occipital carinae differ in positions and shape from those of both *eroliae* and *complexivus* (see figures), in which these structures are much alike. The sides of the pterothorax are less convex and the posterolateral angles more rounded, thus resembling *complexivus*. The dark bands across the tergites are continuous in both sexes, as in *complexivus*, but the shape of band in segment VII of the male is different, the median portion being bent sharply forward and more rounded than in VI (see figures); the incrassations in lateral portion of tergites are also quite different, more so in the female than in the male (see figures).

The male genitalia differ strongly from those of both *complexivus* and *eroliae*. The paramers are more uniformly circular, with marginal carinae different from those of *eroliae* (more as in *complexivus*), while the endomera is very different from both, being shorter and wider and of entirely different shape and manner of attachment (see figure), the style of attachment being similar to that of *complexivus;* the seminal duct is very much longer than the duct in either of the above species.

Unfortunately all of the material of these two species was in a rather poor condition for study, many characters being invisible, especially details of the head.

This species is represented by the male holotype, female allotype, 3 male and 5 female paratypes.

Measurements of the Types of *Carduiceps pusillus*.

	Male		Female	
	Length	Width	Length	Width
Body	1.35	.....	1.59	.....
Head	.33	.268	.35	.28
Prothorax	.108	.14	.12	.152
Pterothorax	.13	.195	.152	.205
Abdomen	.835	.305	1.04	.37
Antennae	.108	.....	.12	.....
Basal plate	.14	.07		
Paramer	.081	.015		
Endomera	.073	.036		

Anatoecus autumnalis, n. sp.[10]

(Figures 73, 74 and 75)

Types, male and female adults, from *Dendrocygna a. autumnalis* (Linné), collected by C. Shaw at Tamuín, San Luis Potosí, México, September 19, 1946 (in L. S. U. M. Z. coll.).

This is the first record for the genus *Anatoecus* from any species of *Dendrocygna*. In my own collection there is a female from *D. b. bicolor* and 2 females from *D. autumnalis discolor*. The first is undoubtedly specifically distinct from the present species, *autumnalis*, while the latter is probably merely a subspecies of it. Without the males it is not possible to describe these forms intelligently.

The present species has been compared with five known species of the genus and material (unstudied) from ten species of New World ducks and may be easily separated from all of them by just one character, the series of 12 heavily chitinized bars lying on top of the posterior portion of the rounded part of the male genitalia (see figure). There is one slightly immature male of the series which lacks the bars on the genitalia, but in all the others they are strongly developed.

The head measurements are decidedly different, also, from those of *monteiroi* Guimãraes & Barrios Netto. The male of *autumnalis* has head measurements of .467 x .445 against .45 x .42 for *monteiroi*, while the antreior portion of head (surrounded by the hyaline margin) measures .14 x .28 in *autumnalis* against .19 x .23.

The species is represented by the male holotype and female allotype and 6 male and 14 female paratypes.

Measurements of the Types of *Anatoecus autumnalis*.

	Male		Female	
	Length	Width	Length	Width
Body	1.43	.....	1.53	.....
Head	.467	.445	.52	.49
Prothorax	.15	.303	.163	.326
Pterothorax	.175	.412	.175	.43
Abdomen	.76	.55	.79	.61
Antennae	.185	.045	.163	.043
Male genitalia	.575	.174		

[10] Clay and Hopkins go into considerable detail with *Anatoecus dentatus* (Scopoli) on pages 16 and 17 of *Early Literature on Mallophaga*, where a large figure of the male genitalia is given. In this figure are shown the 12 bars within the genitalia, more or less as in *A. autumnalis*, but of different shape. I have two males of *dentatus* from the type host, and there is no sign of these bars within the genitalia. I have examined males of 7 species of American ducks in which no bars are present, but they are present in specimens of *A. obtusus* (Giebel), from *Somateria m. mollissima*. Apparently this character needs further careful investigation.

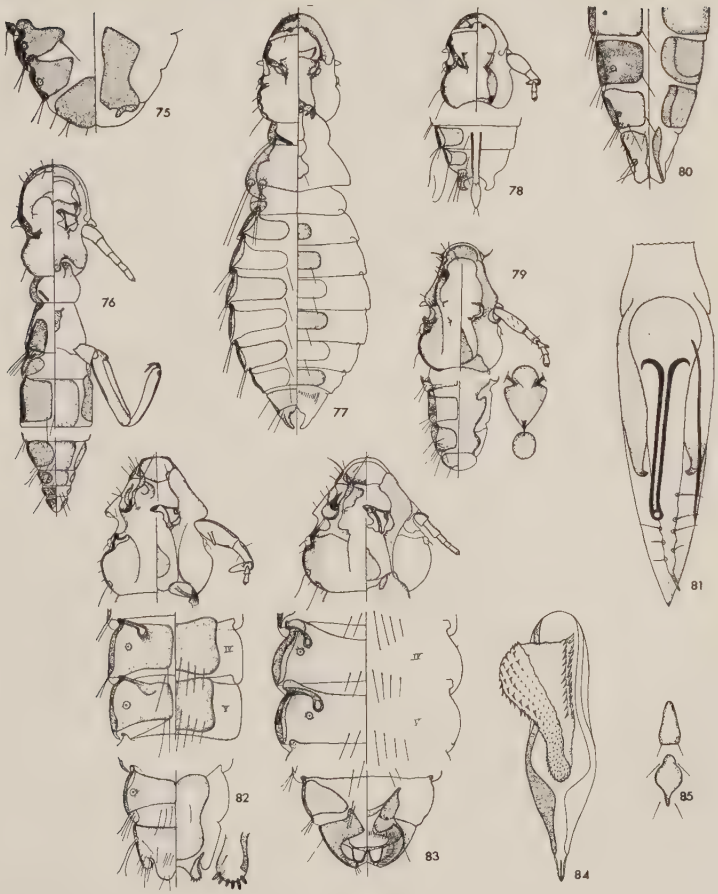

Fig. 75. *A. natoecus autumnalis*, n. sp. ♀, apical segments of abdomen
Fig. 76. *Lipeurus bakeri*, n. sp. ♀ im., head, thorax, and portions of abdominal segments
Fig. 77. *Oxylipeurus (Epicolinus) abdominalis*, n. sp. ♀, entire body
Fig. 78. *O. (E.) abdominalis*, n. sp. ♂, head and apical segments of abdomen
Fig. 79. *Anaticola dafilensis*, n. sp. ♂, head, apical segments of abdomen, and thoracic sternites
Fig. 80. *A. dafilensis*, n. sp. ♀, apical segments of abdomen
Fig. 81. *A. dafilensis*, n. sp. ♂, genitalia
Fig. 82. *Pectinopygus (Epipelicanus) canadensis*, n. sp. ♂, head and portions of abdominal segments
Fig. 83. *P. (E.) canadensis*, n. sp. ♀, head and portions of abdomen
Fig. 84. *P. (E.) canadensis*, n. sp. ♂, genitalia
Fig. 85. *P. (E.) canadensis*, n. sp. ♀, thoracic sternites

Lipeurus bakeri, n. sp.
(Figure 76)

Type, female immature, from *Meleagris gallopavo intermedius* Sennett, collected by Rollin Baker, Kenedy Co., Texas, December, 1941 (in L. S. U. M. Z. coll.).

At the present time there is no species of the genus *Lipeurus* recognized as a parasite of the turkey, either domestic or wild. Hopkins and Clay (*Early Literature of Mallophaga*, Part I, p. 261) contend that *Pediculus meleagridis* Linné refers to the common *Chelopistes* parasitic on the turkey and is not a *Lipeurus* as given by some authors. Harrison restored Linné's name to the species in 1916. Undoubtedly this decision is correct, since it would not be possible to confuse *Chelopistes* with *Lipeurus* or *Oxylipeurus*, and furthermore, *Chelopistes* is the common mallophagan parasite of the turkey, and the one most likely to have been seen by Linné.

Diagnosis.—The present species is clearly a *Lipeurus*. The type, an immature female, cannot be confused with either *Oxylipeurus corpulentus* or *O. polytrapezius*, both parasitic on the turkey. The shape of the head and its internal carinae is that of *Lipeurus*, as well as the apical segments of the abdomen, which are entirely different from these segments in immature specimens of *Oxylipeurus* and may be almost duplicated in the pre-adult instar of *Lipeurus numidae* (Denny).

The head is much wider at the base of the clavi than at the temples; there are no papillae on the inner margin of the marginal carina of the frons, as in *Oxylipeurus;* the structure of the posterior portion of the head is very unusual, possibly unique; the gular plate resembles somewhat that of *L. maculosus* Clay. The abdomen is almost parallel-sided and instead of having 8 segments, as in the adult female, has 10, with the 6th spiracle in segment VII, so that VIII, IX and X are combined into a single segment (VIII) in the adult. Just what the structure of this segment resembles is problematical.

In segment VIII the tergites are divided medially, as in the anterior segments, but in IX and X the tergite covers the entire segment, excepting a small portion of the tip of X. Unquestionably the type of this species and the single female paratype, of identical appearance, represent the pre-adult instar of a previously undescribed species of *Lipeurus*. They possess no characters suggesting that they might be immature specimens of either *Oxylipeurus polytrapezius or corpulentus*, although 7 females of *O. corpulentus* and 12 specimens of *Chelopistes meleagridis* were collected on the

Measurements of the Female Holotype of *Lipeurus bakeri*.

	Length	Width
Body	2.26	.....
Head	.55	.37
Prothorax	.20	.25
Pterothorax	.26	.303
Abdomen	1.40	.35
Antennae	.37	.12

same individual host with them. Unfortunately no adults and no males of the new species were taken.

The fact that these two lice were collected from a wild bird and not a domestic turkey precludes all possibility of their acquisition from some domestic fowl. It is greatly to be desired that adult specimens of both sexes of this interesting louse be secured.

Oxylipeurus (Epicolinus)[11] *abdominalis*, n. sp.

(Figures 77 and 78)

Types, male and female adults, from *Dendrortyx barbatus* Gould, collected by R. Newman at Xilitla, S. L. P., México, June 12, 1947 (in L. S. U. M. Z. coll.).

Diagnosis.—This species is typical of the subgenus *Epicolinus* Carriker, as would be expected from the close affinity of its host with the genus *Colinus*. However, it differs considerably from all of the other known species of that genus in having a shorter head and much wider abdomen in both sexes, as well as a shorter and wider pterothorax.

The tip of the abdomen in both sexes resembles somewhat those of *E. ovaticephalus*, but it lacks the conspicuous sexual dimorphism of the abdomen found in that species, both sexes having a rather short abdomen of the same shape, wider even than in the female of *ovaticephalus*.

The male genitalia are typical of the genus, the genitalia themselves being very minute, lying normally far back inside the sheath. There are two rather strong setae set on the upper side of the tip of the genital sheath, a character not hitherto seen in this group. The species is represented by the female holotype, male allotype and 2 male and 4 female paratypes.

Measurements of the Types of *Oxylipeurus abdominalis*.

	Male		Female	
	Length	Width	Length	Width
Body	1.87	.....	2.03	.....
Head (at clavi)	.....	.326	.....	.37
Head (at temples)	.50	.37	.564	.44
Prothorax	.217	.30	.205	.326
Pterothroax	.25	.49	.27	.53
Abdomen	.93	.51	1.19	.71
Antennae	.27	.078	.27	.043
Male genitalia	.36	.043		

[11] The genus *Epicolinus* Carriker was described in 1945, the genotype being *Lipeurus clavatus* McGregor, from *Colinus virginianus texensis* (Rev. Brasil. Biol. 5, 104). It was reduced to a subgenus of *Oxylipeurus* by Hopkins and Clay in the 1952 *Checklist of Mallophaga*. With all due respect to the authors of the *Checklist*, I do not think that it is congeneric with *Oxylipeurus*.

Anaticola dafilensis, n. sp.
(Figures 79, 80 and 81)

Types, male and female adults, from *Dafila acuta* (Linné), collected by M. A. C. at Lincoln, Nebraska, February 28, 1901 (in coll. of M. A. C.).

I have compared this series of 4 males and 9 females from *Dafila acuta* with authentic specimens of *A. crassicornis*, *A. cairinensis*, *A. merg serrati*, *A. lepidotus*, *A. depuratus* and *A. rubro-maculatus*, and they differ in greater or less degree from all of them.

Diagnosis.—Resembles more closely *crassicornis* in shape of head, but differs in various details. The penis is longer than in *crassicornis* and shorter than in *mergiserrati* (.195 against .152 and .22). Three males of *crassicornis* measure .152, .152, and .14, while the measurements for *mergiserrati* given by Clay and Hopkins are (1).20, (6).22, (3).23.

A. dafilensis also differs from *crassicornis* in the shape of the thoracic sternal plate. I have 2 females of *mergiserrati* from the type host, which differ strongly from *dafilensis*, as well as from my specimens of *crassicornis*, the abdomen being long and slender, sharply constricted at junction of segments II and III, and with apical segments tapering to a slender point, without trace of bifurcation; the large thoracic sternite is elongated oval, without lateral wings, and with bluntly pointed anterior end, but the small posterior sternite is rounded, as in *dafilensis*.

The color pattern of the tergites is different, as well as the shape of the genital sternite.

The present species differs from *cairinensis* in shape of head, cephalic carinae, abdominal markings, male genitalia and thoracic sternal plates. From *depuratus* it differs in the shape of the head, the front in that species being very narrow, tapering uniformly from eyes to frons; cephalic carinae also differ. *A. lepidotus* (from *Aix sponsa*) is very different, with a very narrow frons, narrower, even, than in *depuratus;* the cephalic carinae differ strongly as well as the thoracic sternite and abdominal tergites. *A. rubro-maculatus* is also quite different, the abdomen in the male being

Measurements of the Type of *Anaticola dafilensis*.

	Male		Female	
	Length	Width	Length	Width
Body	2.78	.....	3.56	.....
Head (at clavi)	.....	.324	.....	.39
Head (at temples)	.65	.38	.695	.46
Head (at frons)	.....	.185	.....	.19
Prothorax	.238	.314	.27	.347
Pterothorax	.465	.456	.50	.50
Abdomen	1.595	.42	2.28	.673
Antennae	.36	.07	.27	.046
Basal plate	.56	.11		
Paramers	.174	.10		
Penis	.195	.075		

short and strongly expanded posteriorly and constricted at I and II; the prothorax is as wide as pterothorax; and the head is short and wide, with preantennal portion narrowing and more tapering in the female.

From *constrictus* (Kellogg) it differs in being longer and narrower in the abdomen (male: 2.78 x .42 against 2.31 x .50); the head is longer and narrower (male: .65 x .38 against .53 x .41). In females the differences in measurements are greater. In *dafilensis* there are four fine, pustulated setae on each side of the canal posterior to the tips of the paramers, which I have not seen in other species and which are difficult to see and may be easily overlooked. The type series consists of the male holotype, female allotype, 2 male and 8 female paratypes. In addition, there is one male from the type host collected by R. Newman at Tamuín, S. L. P., México, November 17, 1946. This single male agrees in all respects with the holotype, and is in the Louisiana State University Museum of Zoology collection.

Pectinopygus (Epipelicanus) canadensis, n. sp.
(Figures 82 - 85)

Types, male and female adults, from *Pelecanus erythrorhynchos* Gmelin, collected by C. Shaw at Ajinche, S. L. P., México, November 10, 1946 (in L. S. U. M. Z. coll.).

Diagnosis.—Of the same general type as the various species of this genus found on the pelicans, but most closely related to *P. occidentalis* Thompson, from *Pelecanus o. occidentalis* (type from Kingston, Jamaica).

When Thompson described *occidentalis* [12] he had not seen specimens from *P. erythrorhynchos* but was correct in assuming that they would also prove to be a new species.

I have compared a series of 5 males and 3 females of *canadensis* with 2 males and 3 females of *occidentalis* Thompson (from the type host) and with 4 males of *forficulatus* (Nit.), also from the type host, and find them to be different in many small characters. Thompson has published excellent figures of *occidentalis*, which may be compared with those here given for *canadensis*.

P. canadensis differs from *occidentalis* as follows: there is but a very faint indication of striations in the anterior portion of the anterior plate (well marked in *occidentalis*); the premarginal carinae differ decidedly in shape and chitinization; the gular plate is smaller; the thoracic sternites are quite different in shape (see figures); the abdominal tergites and sternites are also differently shaped, the former less widely separated medially; the male genitalia differ in shape of basal plate and paramers; the apical abdominal segments differ slightly in both sexes. In *canadensis* the male is larger (2.95 x .62 against 2.70 x .59) as is the female (3.12 x .93 against 2.80 x 1.00).

The species is represented by the male holotype, female allotype, 1 male paratype, also 3 males and 2 females from the type host, collected by J. C. Crawford, Jr., at Lincoln, Nebraska, November 30, 1900, the latter in the collection of M. A. C.

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[12] Ann. & Mag. Nat. Hist. (II), 14, p. 318, figs. 1 - 9.

MEASUREMENTS OF THE TYPES OF *Pectinopygus canadensis.*

	Male		Female	
	Length	Width	Length	Width
Body	2.95	.....	3.12	.....
Head	.65	.54	.65	.635
Prothorax	.27	.456	.27	.50
Pterothorax	.347	.49	.38	.564
Abdomen	1.85	.62	1.95	.93
Antennae	.43	.108	.27	.054
Basal plate	.56	.175		
Paramers	.06	.033		

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A NEW SPECIES OF CULICOIDES FROM FLORIDA WITH ADDITIONAL DISTRIBUTION DATA FOR THE GENUS (DIPTERA: HELEIDAE)

Elisabeth C. Beck
Florida State Board of Health, Bureau of Entomology, Jacksonville

In the course of examining mosquito light trap material at the Florida State Board of Health, Bureau of Entomology, a new species of *Culicoides* has been found and four other species taken which are new records for the State. Type specimens of the new species are deposited in the United States National Museum in Washington, D. C., and paratypes are in the University of Florida Collection, Gainesville.

Culicoides venustus Hoffman:—This species has now been found in eleven Florida counties across the northern part of the State from Escambia to Clay and south to Alachua County. In Jackson and Madison Counties some specimens have only one light spot in the tip of cell M_1 (others have a faint second spot), but all other characters, including the spines on the hind tibiae are typical of *venustus*. Tibial spines are an excellent character for separating *venustus* from *inamollae* where any doubt exists, as there are five spines on the hind tibiae of *venustus* and six on *inamollae*.

Culicoides inamollae Fox and Hoffman:—In a previous paper (1952) the writer accepted Lane's (1950) synonomy of *inamollae* as *guttatus*, but an opportunity to examine further specimens of *guttatus*, and the apparent confusion of the status of *inamollae* in the literature, has led the author to believe it wisest to retain the name *inamollae* for Florida specimens until such time as the taxonomy is straightened out. There appears to be no question but that Florida's specimens are the same as specimens from the type locality of *inamollae*, so whatever the taxonomic status of that species becomes, Florida specimens will be the same. This species has been recorded from thirty-five counties throughout Florida. *C. inamollae* and *C. venustus* have been taken from the same light traps in several northwestern counties in the State.

Culicoides obsoletus (Meigen):—Reported formerly only on the basis of a single female specimen from Marion County, this species has now been taken in Lake, Highlands, and Alachua Counties. A single male was captured in Alachua County.

Culicoides canithorax Hoffman.—This species was previously reported as occurring both on the coast and inland. It is now evident that the specimens recorded from inland counties were not this species. *C. canithorax* has been taken in twenty-four counties, all coastal.

Culicoides biguttatus (Coquillet):—This species has been found in two new counties, Jackson and Baker. A number of males have been taken. The species was found to be most abundant during April and May in 1954.

Culicoides travisi Vargas:—Records for the State were formerly based on female specimens. Males have now been taken and the species found in north and central Florida counties.

Culicoides nanus Root and Hoffman:—This species has been taken in Escambia, Alachua, and Flagler Counties. In all counties males were taken.

Culicoides niger Root and Hoffman:—Previously recorded only from Citrus and Walton Counties in Florida, it has now been taken in light traps in sixteen counties as far south as Highlands County. The period in which it is abundant is apparently short; most specimens taken in light traps occurred in February and March, both in 1954 and 1955. Males are common in light trap collections.

Culicoides haematopotus Malloch:—This species has been taken in thirty-six counties, coastal and inland, from northwest Florida to the southern tip of the State. It is one of our most widely distributed species.

Culicoides spinosus Root and Hoffman:—This species has been identified from Escambia and Volusia Counties on the basis of male genitalia. It undoubtedly occurs in many other counties, but females are difficult to separate from similar species.

Culicoides piliferus Root and Hoffman:—This species, originally reported as occurring only in Escambia County in Florida, has proved to be rather widespread in the State, and in some localities very abundant. It is recorded from seven counties as far south as Highland County. Most county records are based on the identification of male genitalia.

Culicoides loughnani Edwards:—All previous Florida records were from the extreme southwestern coast. Four new county records: Levy, Flagler, St. Lucie and Duval, extend the known range northward on the western coast, and represent the first records on the east coast. It should be remarked, however, that only occasional specimens have been found in these northern counties, and all specimens from there have been females.

Culicoides floridensis Beck:—Originally described from Sarasota County, Florida, this species has now been found in Volusia, Marion, Broward, and Highlands Counties. It apparently is most abundant in midsummer.

The following species have not previously been recorded from Florida:

Culicoides variipennis (Coquillet):—This species has been taken in Walton and Jackson Counties. Apparently the western section of Florida represents the extreme southern limits of the range of this species in the Eastern United States.

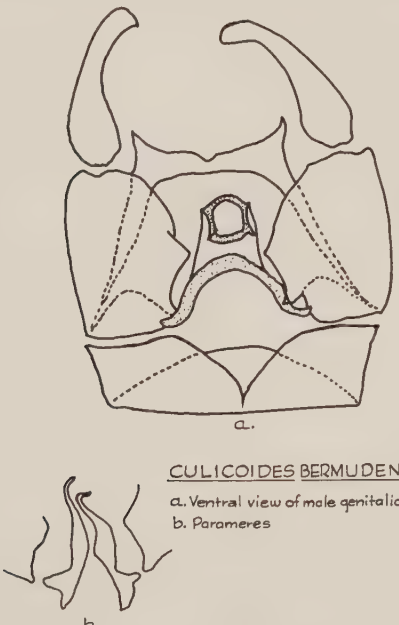
Culicoides ousairani Khalaf:—This species, described from Oklahoma, (1952), has been found in light traps in Escambia, Taylor, Jackson, Alachua and Volusia Counties. Males taken in these traps were compared by Dr. W. W. Wirth with specimens in the National Museum and found to agree.

Culicoides pusillus Lutz:—Specimens have been taken in Volusia, Alachua, Marion and Okeechobee Counties. A comparison of male genitalia with specimens which Dr. Irving Fox kindly sent from Puerto Rico, established that the Florida specimens were *C. pusillus*.

There are no new distribution data of interest for the following species occurring in Florida: *C. arboricola* Root and Hoffman, *C. villosipennis* Root and Hoffman, *C. crepuscularis* Malloch, *C. melleus* (Coquillet), *C. furens* (Poey), *C. stellifer* (Coquillet), and *C. baueri* Hoffman.

Culicoides bermudensis Williams:—This species recently described from Bermuda (1956) has been taken in a light trap at Santa Rosa in Walton

County, Florida, during July and August in 1955. As the male has not been described, a description of the male genitalia follows.



CULICOIDES BERMUDENSIS-Williams
a. Ventral view of male genitalia - parameres omitted.
b. Parameres

FIGURE-1.

Male Genitalia (Figure 1): Apicolateral processes of the ninth tergite well-developed; posterior margin of the ninth tergite with a rather broad rounded notch; ninth sternite with a broad V-shaped notch dividing the sternite almost to its base, the membrane of the ninth sternite spiculate; basistyle stout, dorsal root rather short and blunt, ventral root lacking. Aedeagus consists of a low wide arch with a broad tip having a curved, well-chitinized apex. Parameres with heavy footed bases, tips tapering to a narrow point.

The females of this species taken in Florida differ in several respects from the specimens taken in Bermuda. In general, Florida specimens are more grayish and darker with less distinct wing spots, while the Bermuda specimens are lighter, more yellowish, with more distinct wing spots. Bermuda specimens have an apical light spot in cell R_5; no such spot occurs in Florida specimens. Also the radial cells of Florida specimens are entirely dark and more closed, while the radial cells of Bermuda specimens are more open and there appears to be a light spot cutting across the tip of the 2nd radial cell. As there is a general agreement in other characters, it is probable that the Florida form represents, at most, a subspecies, and much wider collecting would be necessary before that status could be assumed.

Culicoides knowltoni, n. sp.

FEMALE: Length 1.8 mm.; wing 1.3 by 0.65 mm.

Head and appendages dark brown, except antennae lighter; eyes bare, well separated with hair socket between. Antennae with flagellar segments in proportion of 18:12:12:12:12:12:14:14:30:32:36:38:46, antennal ration thus 1.6. Distal sensory tufts on segments 3 - 14, inclusive. Palpal segments in proportion of 8:15:18 x 8:7:7, third segment swollen just beyond middle with broad fairly shallow pit containg many spoon-shaped sensillae.

Mesonotum light brown pruniescent; darker brown on humeri, indistinctly along a narrow median line, a small spot posterior to sensory pits, and in prescutellar depression, the hairs light yellowish. Scutellum dark brown with four long brown bristles. Postscutellum and pleuron dark brown. Legs light brown with very dark knees; hind tibial comb of four long brownish bristles.

Wing with radial cells complete, costa .6 as long as wing. Macrotrichia dense over entire wing. Wing background gray with numerous more or less confluent light spots. Four light areas along costa, one across wing base confluent with large light area in base of anal cell; one from costa, over r-m crossvein into base of cell M to cubital vein; one just beyond and under 2nd radial cell; and one in cell R_5 about halfway between 2nd radial cell and wing apex. Aside from light area at base cell M_1 has two light spots, not open to wing margins. Cell M_2 also has two light spots. Cell Cu_1 has one light spot open to wing margin. Anal cell is light at base and has an hourglass-shaped spot close to vein Cu_2. In some specimens these spots tend to be largely confluent. This wing pattern differs from that of *crepuscularis* only in the light area under the 2nd radial cell. Halteres white.

Abdomen dull light brown; spermatheca (Figure 2c) single, dark, elliptical, at least four times as long as wide, the duct not chitinized, but with short fork at the posterior fourth, no apparent ring or rudimentary spermatheca.

MALE GENITALIA (Figure 2a, 2b): Ninth sternum with broad shallow excavation, the posterior membrane spiculate; ninth tergum only slightly tapered, with well developed apicolateral processes, the posterior margin between them with a deep notch, and minute serrations between the notch and apicolateral processes. Basistyles broad, the dorsal root short and almost truncate, the ventral root lacking; dististyles tapering and slightly curved inward. Aedeagus consisting of a broad heavily chitinized, footed arch, the tip broadly rounded and only lightly chitinized. Parameres very heavy footed and tapering to long, slender, curved pointed tips.

I take pleasure in naming this species for Dr. George F. Knowlton, Extension Entomologist, Utah State Agricultural College.

C. knowltoni is very close to *crepuscularis*. Females are separated from *crepuscularis* by the distinctive spermatheca and by the presence of a continuous light area beyond and under the 2nd radial cell. However, this light area is sometimes also present in *crepuscularis*. The male genitalia has broader basistyles, the aedeagus heavier with broader more truncate tip, and irregular serrations between the apicolateral processes and the notch on ninth tergum. *C. knowltoni* has been collected in twelve counties,

inland and coastal, throughout peninsular Florida. It has been taken throughout the year, but one light trap checked weekly indicates that it is predominant March through May. Specimens apparently of this species have been previously recorded from Florida by Foote and Pratt (1954) and Beck (1952).

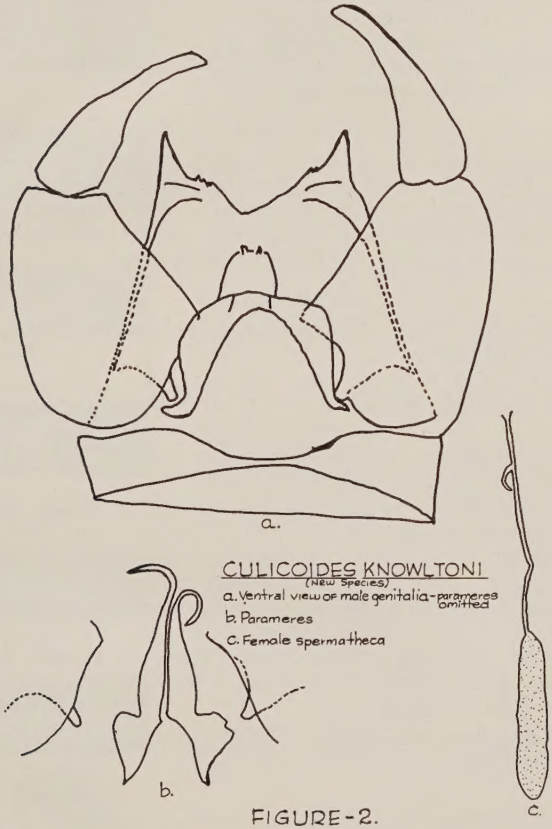


FIGURE-2.

The five species which this paper adds to the previously known fauna of Florida brings the number of known species of *Culicoides* in Florida to a total of twenty-seven. This includes *Culicoides guttipennis* (Coquillet) recorded from Escambia County by Foote and Pratt (1954), and *Culicoides tricoloratus* Wirth recorded from Palm Beach County by Wirth (1953), species which have not yet been taken in State Board of Health light traps. Four of the twenty-seven species are probably of West Indian origin; *C. inamollae*, *C. pusillus*, *C. tricoloratus*, and *C. loughnani*, are thus far recorded only from Florida in the United States. *C. floridensis* and *C.*

bermudensis have been recorded only from Florida and Bermuda, suggesting possible endemicity. Twenty species are known throughout the eastern United States, although Florida apparently is the extreme southern limit of the ranges of some species such as *venustus*, *variipennis*, and *guttipennis*.

Appreciation is expressed to J. A. Mulrennan, Director of the Bureau of Entomology, Florida State Board of Health, for encouraging this study, to Chester Turknett, Bureau of Sanitary Engineering, Florida State Board of Health, for preparing the drawings, and to Dr. W. W. Wirth, United States National Museum, for aid in determining the taxonomy of the species and for reviewing the manuscript.

Summary

A new species of *Culicoides* from Florida, *C. knowltoni*, is described and the male of *C. bermudensis* Williams is described. Florida distribution records on four species new for the State are given, together with new county records on previously recorded species. This brings the number of known species of *Culicoides* in Florida to twenty-seven.

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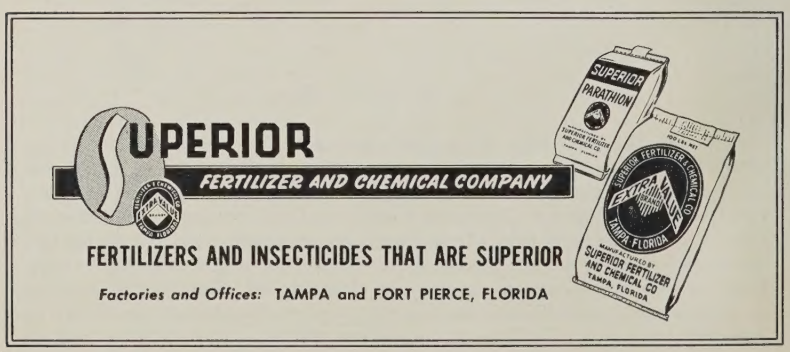

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